COMMUNICATION Story maps help to make sense of your science **p.115**

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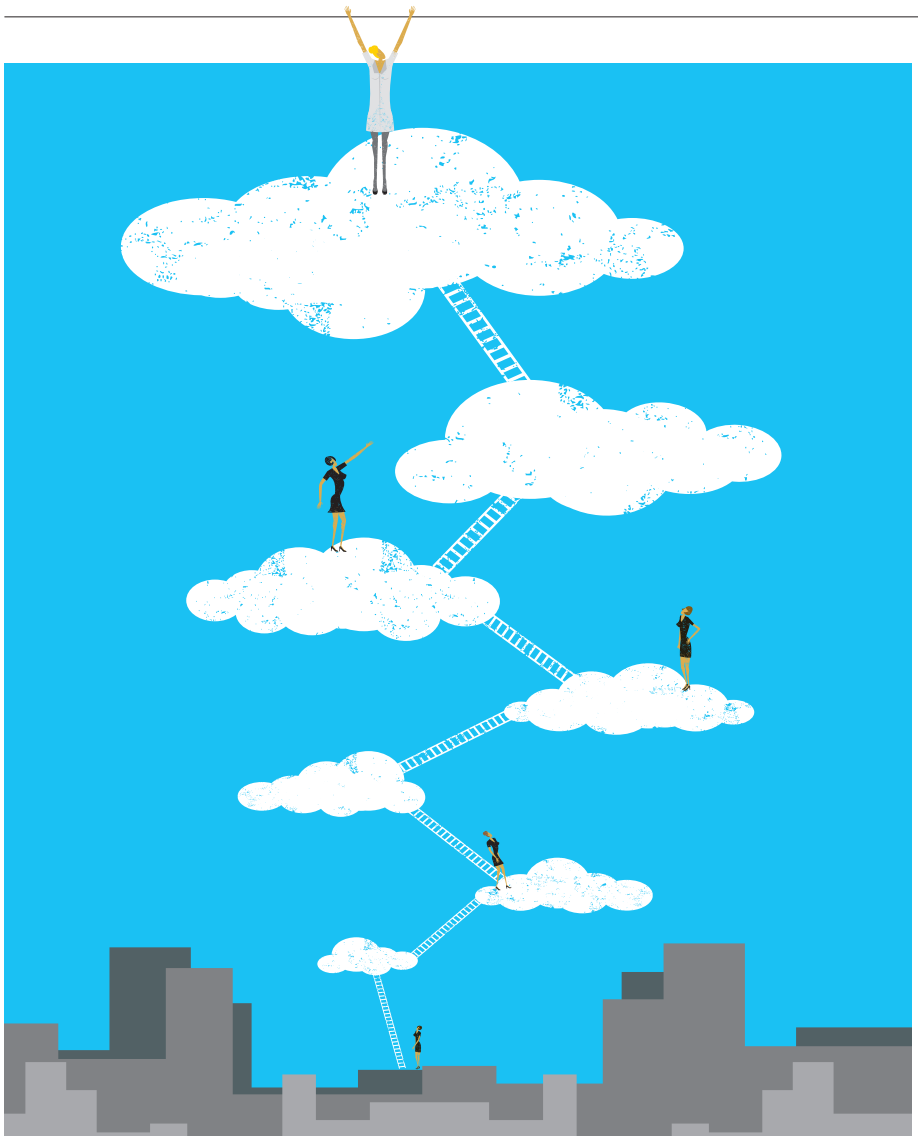

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RECOGNITION

Build a reputation

To get respect in a field, scientists need to consider not just their work, but also their interactions with others.

BY CHRIS WOOLSTON

Less than a decade after receiving her undergraduate degree in biology, Holly Bik has transformed herself. When she started her PhD, she was as an aspiring marine biologist with a deep interest in nematode worms. Today, she is a highly regarded interdisciplinary computational and evolutionary biologist who travels the world to give talks on topics that range from use of social media to what she dubs 'ecophylometamicrobiomics' — the identification of eukaryotic microbes in the environment through sequencing. Now at the University of Birmingham, UK, she has led the development of the data-visualization platform Phinch and is actively involved in three working groups tackling issues as diverse as the evolution of indoor microbial communities and the biodiversity of the deep sea.

It is all a big leap from worms. How did she become such a sought-after figure in the science community? The key to property is said to be location, location, location; in science, it's all about reputation, reputation, reputation. "I'm trying to cultivate a reputation as an interdisciplinary researcher," says Bik. "Marine biology, computer programming, genomics — I want people to think of me as a potential collaborator."

If science were truly a double-blind enterprise, generic researchers X, Y and Z would compete for citations, grants, invited talks and promotions solely on the basis of their accomplishments and aptitude. In the real world, scientists have names, and those names come with baggage, both positive and negative. In an increasingly competitive scientific environment, a reputation may matter more than ever, says Philip Bourne, associate director for data science at the US National Institutes of Health (NIH) in Bethesda, Maryland. "The degree of separation between any two scientists is relatively small," Bourne says. "If you're colossally brilliant, you can be a jerk and still have a good reputation. But if you're a mere mortal, the way you treat science and the people around you will come back on you."

Savvy young researchers make the effort to define themselves. As they move through their professional lives, they work to ensure that their name is an asset to their development — and not a deficit or a neutral factor. For early-career scientists, Bourne says, reputations are based largely on the quality of their work, which should always be a top priority. But researchers also need to keep several key issues at the forefront of their minds: their relationships with fellow scientists, their presence in the broader scientific community and their willingness to do what it takes to protect and promote their personal brand. Conducted appropriately, peer review, social-media use and collaboration can all help to create and build a positive identity. "Science is like living in a small village," Bourne says. "You can't escape what's known about you."

Once a reputation reaches critical mass, it ▶

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can start to matter as much as or more than the strength of ideas, adds Alexander Petersen, a mathematician and economist at the IMT Institute for Advanced Studies Lucca in Italy. "Reputation affects all areas of science," he says. "You can't know everything about every researcher, so name recognition becomes an important discrimination tool."

Certainly, broad measures of impact such as *h*-indexes form an important part of a researcher's reputation. But such raw numbers do not tell the whole story of a scientist, says Ginny Barbour, chair of the Committee on Publication Ethics in Brisbane, Australia, and medicine editorial director of the Public Library of Science. In 2011, she and Bourne wrote an editorial[1] that set out ten important steps to building and maintaining a scientific reputation. Racking up as many citations as possible was not on the list. Instead, they encouraged researchers to commit themselves to integrity, attention to detail and productive interpersonal relationships (see 'Tricks of the trade').

TEAM PLAYER

Some steps — such as putting in the time and effort needed to do good reviews of grant applications and papers — may not pay obvious dividends at first, Barbour says, but the rewards build over time. "Good academics take the job of reviewing very seriously," she says. "I've seen reviews come in at midnight on a weekend. Or on Easter Sunday." Even when reviews are supposedly anonymous, the reviewers can often be identified by tone and style, she says. And if a reviewer makes the effort to carefully weigh up the science and provide thoughtful and constructive feedback, the word gets around. "Any academic can tell you who a good reviewer is," she says.

At first glance, having a reputation as a shoddy reviewer might not seem like much of a burden to a career. After all, as Barbour notes, poor reviewers are likely to get fewer requests to judge grant applications, so they have more time to devote to their actual work. But those researchers can also develop a reputation for not being a team player, a label that can be debilitating in the increasingly collaborative science arena. In a similar vein, Barbour says, it is important to show concern and respect for students and for other people in the lab, not because students can immediately help a career, but because word will spread if a scientist seems too demanding, stand-offish or — worse — eager to accept credit for someone else's work. "It benefits everyone to be professional and supportive," she says.

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Barbour says that if she had a chance to update her editorial on building a reputation, she would add one more item: cultivate a positive online presence. Some researchers have already received that message. "Social media has been a big part of building my own reputation," Bik says. Twitter, she says, has been an excellent forum for burnishing her personal brand as a multidisciplinary, collaborative researcher. Every time she tweets about her own work or her take on other papers, her reputation spreads. "I'm regularly invited to speak at conferences and give departmental seminars at different institutes. Many of these invitations happen because students and other researchers know about my work through Twitter," she says. Bik, whose handle is @Hollybik, has tweeted more than 11,000 times since September 2010 and has more than 5,000 followers, including scientists from a wide variety of fields.

Bik explains that she has a strategy for promoting her latest publications on social media. "I'll tweet throughout the week leading up to the publication," she says. "I'll also write blog posts and work with the university press office to get coverage." This approach not only increases the visibility of her work, but also ensures that it is promoted in a fair, accurate manner. Her efforts are in keeping with a growing sense in the scientific community that researchers need to be actively involved with press offices to ensure accurate coverage of their work.

Bik is surprised by the number of researchers who seem reluctant to embrace social media. Some do not even bother to have a website. "If you don't create your own online reputation, other people are going to do that for you," she says. She thinks that researchers who stay away from social media are often apprehensive about making a public misstatement or getting into an argument that could jeopardize their standing or their careers. "I think that fear is unfounded," she says. "I have a list of things I will and won't talk about. As long as you're arguing from a scientific perspective, the positives always outweigh the negatives."

Barbour says that scientists should be especially cautious when reviewing another researcher's work publicly. All too often, researchers see review as an opportunity for snarky comments, sarcasm and generally unprofessional behaviour. "It can be very combative and personal," she says. "Everything you say post-publication reflects on you as a scientist. You should treat it the same way you would a pre-publication review."

THE SPREAD EFFECT

Building name recognition can have a cascading effect on a researcher's career. Petersen was the lead author of a study[2] that found that a single 'big name' on a paper can significantly boost citations, regardless of the merits of the content, especially early in the life of a publication.

After calculating 'reputation scores' of 450 highly cited scientists, he and his colleagues found that a tenfold increase in reputation increased the citations by 66%, but

TRICKS OF THE TRADE

How to build a positive reputation

In 2011, an editorial in *PLoS Computational Biology*[1] offered "ten simple rules for building and maintaining a scientific reputation". Here is a brief synopsis of the advice.

- Learn to accept criticism gracefully. As tempting as it might be to fire off a testy e-mail after a real or perceived slight — do not do it. Take the time to respond thoughtfully and professionally.
- Do not ignore people below you on the career ladder. It might not be obvious now, but responding to e-mails and phone calls from students can do wonders for your reputation. If you help them to feel valuable, they will value you in return.
- Take publishing seriously. No matter where you are on the list of authors, diligently check everything that carries your name. And you should never accept — or offer — author credits that are not deserved.
- Declare conflicts of interest. Everybody has conflicts, so it is best to stay open and transparent. And if you are ever asked to review work from a competitor, you should strongly consider opting out.
- Support the scientific community. Review papers, share data, help to organize meetings — in other words, give back to the community as much as you take.
- Do not overcommit. Some scientists fill their slates past the point of reason. With so much to do, few things actually get done well or on time. And that is the sort of thing people notice.
- Be honest with letters of recommendation. You are not doing your reputation — or the world of science — any favours by writing a glowing recommendation for someone who is not up to the job.
- Maintain your integrity. These days, it is easier than ever to take shortcuts with data, images or text. Even a hint of misconduct can ruin a scientist's reputation, with good reason. To maintain a reputation as a reliable and respected researcher, you will have to make sure that every aspect of your work adheres to accepted guidelines. C.W.

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the effect wore off after a large number of citations. "Reputation aggregates," Petersen says. "Every citation spreads your name a little bit more. If you strike it big, you can strike it very big."

Some young researchers try to exploit the big-name effect by collaborating with eminent names in their field, even if it means taking a spot far down on the list of authors. But there are downsides for people who pursue the coat-tail effect. Santo Fortunato, one of Petersen's co-authors and a statistician and social scientist at Aalto University in Finland, notes that famous scientists do not necessarily have much time to offer extensive assistance with a paper or anything else. "You should be careful in choosing your co-authors, but realize that a name itself is not enough for a paper to be really successful," he says. "Quality work is still the best statement you can make."

Early-career researchers might think — with some reason — that they can get the best head start on creation of a positive reputation and on their career by earning their PhD at a big-name university. A 2014 study published in *Science Advances*[3] found that one-quarter of institutions accounted for 71–86% of all tenure-track hires in the fields of computer science, history and business. The authors conclude that institutional prestige has an "enormous role" in faculty hiring across disciplines.

Bourne says that this kind of "reputation by proxy" — the assumption that high-quality universities and high-quality labs tend to produce high-quality researchers — is pervasive in science. "Reputation rubs off," he says. But young scientists should not despair if they do not have a pedigree. As a recipient of a PhD from Flinders University in Adelaide, Australia, he is proof that one does not need to attend an illustrious institution to go far in science. After a while, he says, accomplishments start to matter more than the education section of a CV. "I always amuse myself because nobody's ever heard of the university I went to," he says.

Bik, who is originally from Boston, Massachusetts, earned her PhD at the University of Southampton, UK.

She completed a postdoc in a big-name lab — Jonathan Eisen's evolutionary-biology lab at the University of California, Davis — but for the most part she has had to build her reputation the way that most scientists do it: one paper, one conference and one tweet at a time. ■

Chris Woolston *is a freelance writer in Billings, Montana.*

1. Bourne, P. E. & Barbour, V. *PLoS Comput. Biol.* **7,** e1002108 (2011).
2. Petersen, A. M. *et al. Proc. Natl Acad. Sci. USA* **111,** 15316–15321 (2014).
3. Clauset, A., Arbesman, S. & Larremore, D. B. *Science Adv.* **1,** e1400005 (2015).

VANATCHANAN/SHUTTERSTOCK

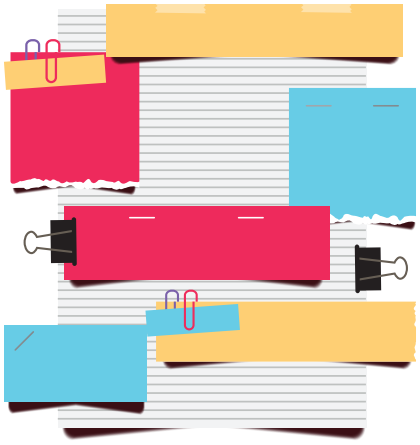
COLUMN

Visual maps bring research to life

Find the story in the science, says **Åsmund Eikenes**.

Research projects do not always follow a linear narrative — but papers, grant proposals and conference talks need to do just that. Early-career scientists can use narrative techniques to create what I call a 'storymap': a visual model of their research that helps them to organize their thoughts and to tell a clear, compelling story about their work.

Creating a storymap helps the researcher to evaluate the strengths and weaknesses of the project critically. I use this technique to visualize my ongoing projects and to improve my understanding of the content and direction of my research. There are several ways to make a storymap, whether on a blackboard, whiteboard or on the web using tools such as Prezi (www.prezi.com). The process is similar to that used by a detective, who pins notes and pictures to a wall as she or he maps out a case.



A researcher can instead use drawings, schematics and preliminary figure panels to map out a project. The process of sorting microscope images, graphs and diagrams into the storymap provides an instant overview of the project's status.

A WEB OF IDEAS

Although an experimental strategy might work well for one aspect of a research project, other parts might need a different approach. The initial research question can also change over time. The storymap helps to clarify these diverging paths early on, and allows the researcher to consider alternative strategies. If a scientist maintains the storymap on a shareable online platform such as Google+, he or she can also communicate the results of ongoing investigations in collaborative projects, and everyone involved can interact with the storymap content in real time. Graduate students, postdoctoral researchers and principal investigators can discuss the overview online and keep up with the progression of the research visually.

Historically, researchers have planned their work using long lists in lab notebooks or on PowerPoint slides. Storymapping, however, provides a clear visual reference for exploring potential new directions. Based on that insight, researchers can decide what supporting experimentation they need to pursue.

The visual model also lets the researcher see missing pieces of the project that need attention. This is instrumental for thoroughly understanding the data, and for narrating the project in a clear and effective way.

Storymapping can also help to guide the manuscript writing process. A well-written paper engages readers with a logical flow of intriguing questions and well-supported answers throughout the text. The storymap highlights the questions and answers that anchor the project, and so serves as a guide for describing the results.

I let the visual overview help me to articulate the sentences that serve to transition between results — the glue of the story. This approach helps me to produce the framework of the manuscript; these paragraphs will guide the narration of the experimental work. I start with the sentences that will link each section of the story, creating a structured backbone that I can use to build the first draft. After this, I find it much easier to fill in the gaps, akin to colouring inside the lines in a drawing book.

This structure places the data into context and shapes the manuscript into a smooth progression of results that trigger insightful questions, which the paper offers specific experimental ways to address.

Over the past four years, I have employed these storymapping techniques both alone and with colleagues, and find that they have significantly contributed to my development as a scientist. Using storytelling as a tool while working on a project facilitates critical thinking, and so enhances the scientific work. ■

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